5. *(a)* *(i)* With a neat sketch of circuit diagram, explain how op amp can be use as adder and subtractor.

(ii) Explain slew rate and concept of virtual ground.

(iii) An inverting amplifier has R_1=10 kΩ and R_f = 100 kΩ. Find output voltage and input current. (3+3)+3+3=12

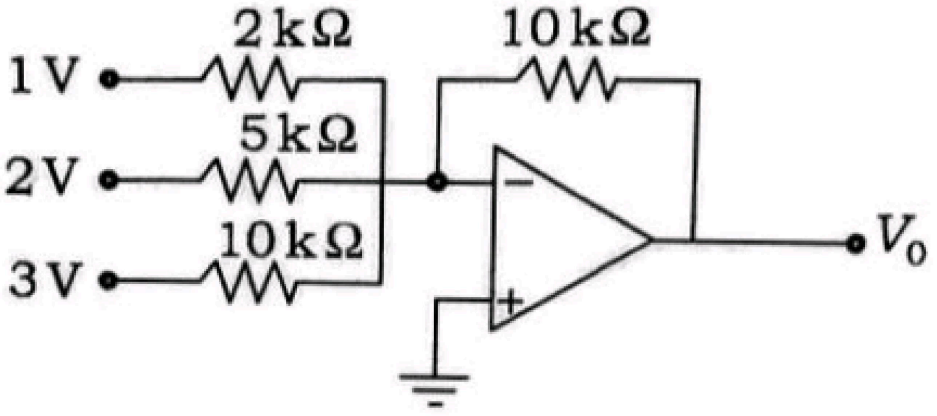
(OR)

(b) *(i)* Explain how op amp can be used as Log amplifier.

(ii) With a neat circuit diagram of Wein Bridge oscillator, explain its operation.

(iii) Define voltage gain, differential voltage gain and common-mode voltage gain.

(iv) Calculate the output voltage from the following fig. : 3+3+3+3=12



of 4.5V for an [illegible]

the output for an input code 1110. 2+4+4+2=12

5. (a) (i) What is the CMRR of an OP AMP?

(ii) What is meant by Virtual ground of an OP AMP?

(iii) Discuss with circuit diagram, the use of OP AMP as an integrator and differentiator.

(iv) A differential amplifier has different mode gain $Ad = 5000$ and $CMRR = 1000$. Find the output voltage for input $V_1 = 200\ \mu V$ and $V_2 = 190\ \mu V$. 2+2+(3+3)+2=12

Or,

(b) (i) Show how OP AMP can be used as an adder and integrator.

(ii) Draw a circuit diagram of wien bridge oscillator using OP AMP. Determine the frequency of oscillation.

(iii) Calculate the actual output voltage of an integrator after 2 sec. for an input voltage of 1 volt. d.c. Given that the resistance at input = 100 kΩ, feedback capacitance = 7μF and the power supplies = ±12 volt.

(3+3)+4+2=12.

(iv) A non-inverting amplifier has input resistance 100 kΩ and feedback resistance 1000 kΩ. Calculate the gain and output voltage if input voltage is 0·5 sin 20 πt volt. 3+3+3+3=12

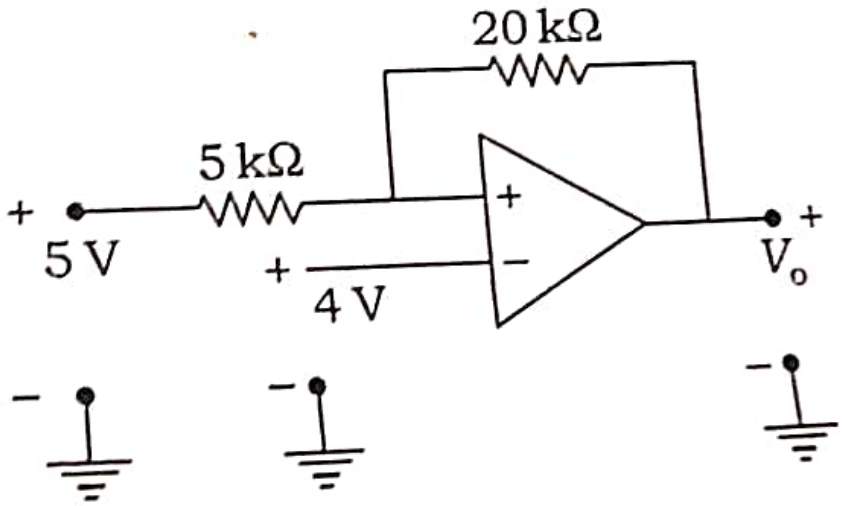
(OR)

(b) (i) With a neat circuit diagram, explain the operation of differentiator using op-amp.

(ii) Define slew rate and CMRR related to op-amp.

(iii) What is Wein bridge oscillator? Draw a circuit diagram for it.

(iv) Calculate the voltage V_0 in the circuit below :



3+2+(1+2)+4=12

★★★